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CHEMISTRY.—*Note on the ice crystals which form on bare soils and on the stems of plants.*[1] VICTOR BIRCKNER, Bureau of Chemistry.
(Communicated by Edgar T. Wherry.)

The formation in frosty weather of ice crystals on certain soils and on the stems of certain plants early attracted the attention of scientists. The literature[2] on these very fascinating phenomena dates back about a century and contains many speculations as to the cause and the mode of formation of these structures. The explanations usually offered rest almost entirely upon physical grounds, it being assumed that the ice in question consists of pure frozen water. My own findings have shown that ice structures both from bare soil and from the stems of dittany (*Cunila origanoides*) contain organic material.

A quantity of ice crystals from bare soil was taken to the laboratory in a small tin pail. The well-known ice structures from *Cunila* stems were also gathered, practically free from dirt, in a glass vessel and taken to the laboratory. Both kinds of ice, after melting and filtering, yielded a colorless opaque solution. After evaporation of 100 cc. of each solution in a platinum dish, the residue was weighed and then ignited. From 100 cc. of filtrate from soil ice, 0.0032 gram of residue was obtained, yielding 0.0016 gram of ash. The same quantity of *Cunila* ice gave 0.0032 gram of residue, but only 0.0006 gram ash. While, therefore, the two filtrates contained the same amounts of stable solids, the proportion of the ash was much greater, and the amount of organic matter correspondingly smaller, in the case of the soil ice than in the ice from dittany. This may well be due to the fact that the *Cunila* ice can be collected without difficulty in a state of very high purity.

Some of the earlier observers of the ice formation on *Cunila* have, it is true, suspected the presence of a foreign substance in these structures. In their papers they state that they have tasted the ice, but,

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[2] Among the most important references to this subject are the following: W. W. COBLENTZ, Journ. Franklin Inst. **178**: 589. 1914; Monthly Weather Review **42**: 490. 1914; Scientific Monthly **2**: 334. 1916. J. SACHS, *Lehrb. Bot.* (4th Ed.), 703. 1872.

finding it devoid of all flavor, they concluded that their suspicion had been unfounded. The low percentage figure of the organic matter present may explain the fact that it is imperceptible to the taste. However, if the ice is allowed to melt, the presence of the organic substance readily manifests itself to the eye through the pronounced turbidity of the solution. The organic substance is, therefore, probably of colloidal character. The question as to whether or not its presence in these ices bears any relation to the peculiar shapes of these structures is, of course, unanswerable at the present time. Our knowledge of the properties of colloidal organic substances is still too incomplete.

An attempt was made to obtain an idea as to the chemical nature of the organic substance present in these ices. Upon concentrating the opaque solution on the steam-bath, a yellowish brown fluid was obtained which had a pleasant odor, similar to freshly baked bread. With ferric chloride solution, a yellow coloration was produced. Permanganate solution, made slightly alkaline, was readily reduced with the formation of an aldehydic odor (not of benzaldehyde, however). Bromine solution was decolorized. These tests would indicate an aromatic unsaturated compound. The latter was tentatively assumed to belong to the styrolene group, of which cinnamic and cumaric acids are members. This assumption was strengthened by the following biological observation. A solution of melted ice from bare soil, after thorough filtration, was kept in a cold storage compartment at a constant temperature of about 1° C. After two weeks, on examining the liquid microscopically, I found it to contain a bacterium in what appeared to be practically a pure culture. The liquid was turned over to Dr. Edwin Le Fevre of the Microbiological Laboratory, who made a careful study of the organism. In this connection, Dr. William J. Robbins has isolated from soil a bacterium which is capable of utilizing cumarin as a source of carbon.[3] Dr. Robbins was kind enough to send us a culture of the bacterium, and the two organisms were subjected to a comparative study by Dr. Le Fevre, who reported that the classification of both organisms should be the same.

From these observations, it would appear that the present physical explanations for the above-mentioned frost phenomena are inadequate and that they cannot be fully explained until the nature and the physical properties of the organic substance present in these ice structures have been elucidated.

[3] W. J. Robbins, Science, N. S. **44**: 894. 1916.

BIOCLIMATICS.—*Intercontinental problems in bioclimatics; with special reference to natural and artificial distribution of plants and animals.*[1] ANDREW D. HOPKINS, Bureau of Entomology.

One of the most important subjects for the consideration of entomologists, botanists, general biologists and agriculturists in the past, and for the future, relates to the introduction of plants and animals from one part of the world to another. This subject is largely one of the relations between life and climate, with regard to the original home of a species, the environments under which it has developed, the range and limits of its natural distribution on one continent, the place of its artificial introduction to another, its establishment there, and its natural or artificial spread from the point of entry.

This address is concerned with some of the principles of the bioclimatic law, methods of application and results as revealed by a study, just completed, of the relations between the advance of spring in eastern North America and western Europe as based on certain phenological events that characterize a particular phase of such advance. This study was made in connection with, and as a preliminary to, a more comprehensive investigation of the relation of the law to the bioclimatic zones of the continents, as a key to solving some of the problems in artificial distribution of desirable plants and animals, in the belief that the true guide to success is to be found in zones of similar bioclimatic types.

While the subject of the bioclimatic law and its application to research and practice has been discussed in papers before this Society, and in recent publications, it is apparent that some of the principles on which the law is founded, and some of the features in the system of application, are not generally understood. Consequently there are skeptics as to the sound basis and the scientific and practical value that we claim for it, which is an excuse for repeating our interpretations.

The bioclimatic law is a law of life and climate as related to the geographical coordinates *latitude*, *longitude* and *altitude*. It includes, as one of its principles, an average, or constant, rate of variation with variations in geographical positions, as manifested by the advance of the seasons and coincident phenomena, and by the geographical distribution of living organisms and types of climate.

[1]Address of the retiring president of the Biological Society of Washington, presented at a joint meeting of the ACADEMY and the Biological Society on April 2, 1921. (Received April 12, 1921.)

In accordance with this law the country-wide average rates of variation in time, temperature, and distance, as related to periodical phenomena, geographical distribution, range and limits of zones, etc., are represented by the unit constants of 4 days to each equivalent constant of 1 degree of latitude, 5 degrees of longitude (or 1 degree isophane), 400 feet of altitude and 1 degree F. of the thermal mean. These unit constants are equivalent, one to the other, and, therefore, the terms of one unit may be converted into those of another as required in the computation and expression of results.

The application of the law to the study of any problem relating to life or climate in which the elements and data are subject to expression in terms of quantity, as to time, temperature, and distance, falls within the category of a mathematical concept of variable nature and, therefore, in the solving of bioclimatic problems, involves the determination of certain evidence and facts by mathematical methods.

Principles involved in the application of the law.—In this mathematical concept of the bioclimatic responses to the solar and other fundamental factors of control there are a number of basic principles, namely:

1. *The principle of geographical unit constants* which relates to rates of variation or gradients of time, temperature, and distance, with variations in geographical position.

2. *The principle of the isophane and altitude* in which the isophane is an expression of the combined unit constant of the latitude and longitude coordinates while the altitude unit constant is a measure of variation with elevation of a place above its sea-level isophane in terms of time, and equivalent units of feet, meters, thermal mean, etc. This principle is fundamental in the systems and methods of application of the law, because it serves to locate and designate a geographical position and to fix its unit value relative to another position designated as the base.

3. *The principle of the sea-level constant.* This represents a uniform element of the system of computation of tables of altitude, time or thermal constants in accordance with the unit constants of the law. Thus, the isophanes of a map or a table, unless otherwise designated, represent a sea-level base and all computations for altitude positions, unless otherwise mentioned, are to or from this base.

4. *The principle of the base station and base data.* This principle, in connection with that of the sea-level constant, serves as a central or basic element of a uniform system of computation and comparison

of quantities. Thus, the geographical position of a continental or intercontinental base station serves as the central unit or key from which, or relative to which, continental and intercontinental tables of sea-level, time, thermal or altitude constant quantities are computed as a basis for making predictions for any given isophane or altitude position on any continent of the northern and southern hemispheres. It also serves as a basis for the establishment of any number of regional and local stations as equivalent bases for the computation of regional or local tables of constants.

5. *The principle of the constant and variable.* This relates to the study of variability with reference to a "constant" as the measure of the relative intensity of the factors of variation. In other words, the variation of the variable from its "constant" magnitude, is the measure, in terms of time, temperature, and distance, of the intensity of the controlling influence from whatever source.

This principle is of fundamental importance because, like the declination of the magnetic needle from its normal position, which enables the surveyor to reach a desired point, the variations of a recorded quantity from its "constant" enable us to determine certain desired facts and evidence in comparative studies of the bioclimatic relations between geographical positions, countries or continents.

6. *The principle of equivalents* as related to equal unit values of certain elements of the law and of the system of application, such as the geographic unit constants, coincident dates in the events of different species, variations from the constant in equivalent terms of time, temperature, and distance; local base stations equivalent to the intercontinental base in conforming to a standard regional or local variation constant.

7. *The principle of the average or norm* as related to variable quantities.

8. *The principle or law of averages* as related to the compensation of errors in reported dates of events, temperatures, general computation of data, etc.

(Examples were given of predictions from records at an intercontinental base station at Kanawha Farms, West Virginia, for places in western Europe. These predictions consisted of dates for the advance of a certain stage of spring to a large number of places in the British Isles and in Germany as characterized by the date of the flowering of the English hawthorn, *Crataegus oxyacantha;* also predictions of bioclimatic or life zones of stations and places represented by

recorded dates of the hawthorn event and recorded normal mean temperatures. It is shown that when the predicted dates are compared with the recorded dates at the same places the variation of the recorded from the predicted gives a reliable guide to the relative difference between eastern North America and western Europe as related to the advance of spring by latitude and by the equivalents of latitude and longitude in accordance with the bioclimatic law.)[2]

It has been found that, for the same latitudes and a 4-year average, spring advances 13 degrees farther north in western Europe than in eastern North America or on the average is 44 days earlier in western Europe than in the same latitude in eastern North America.

In a general comparison of the results of the study as to the relations between the predictions and the actual dates, etc., it is concluded that the significance of the results of this study, based on the phenological facts and evidence represented by the hawthorn event and by the thermal mean, is in showing not only the relations between eastern North America and western Europe, as to the relative advances of spring, but the general range of variations, of the recorded dates and thermal mean equivalents, from the dates, and from the thermal means, predicted from an intercontinental base. These results indicate, as nothing else has heretofore, the amount of regional and local difference in days to be expected for a spring event between a place in eastern North America and places in western Europe. Indeed, the greatest significance of these results is, that the predicted agree so closely with the actual recorded dates, at such a large number of widely separated stations in western Europe, that we may assume that it is practicable to predict dates for certain seasonal events in any given year or average of years for any place on the eastern continent and to do this from a recorded date of the same or equivalent event at the intercontinental base station at Kanawha Farms, West Virginia, and in many cases as accurately as they are usually observed and recorded.

The results relating to the prediction of bioclimatic zones represented by the recorded dates and thermal means are of special significance in indicating the zonal relations between eastern North America and western Europe and in showing that the law may be applied to the preliminary prediction of zones of equal adaptation to certain species and varieties of plants and animals, farm and garden crops, as a guide to the successful introduction of desirable species

[2] The address was illustrated with maps and tables which, together with a part of the paper, are omitted at the suggestion of the author.

and varieties and the prevention of the introduction of pests from one to another part of the world. These, together with the results relating to variations in equivalent days and to the variations of the recorded from a constant thermal mean, are new and represent new methods and principles. The preliminary prediction of minor bioclimatic zones represented by the meteorological stations of the British Isles and Germany is perhaps one of the most important yet attained from the study and application of the bioclimatic law. The close agreement between the zones and variations in days indicated by this method, as compared with those indicated by the phenological method for western Europe, together with the close agreement found between the predicted zones for North America and the Merriam life zones, are significant, not only in this agreement of results from two quite different methods and as related to two continents, but in opening a new field of research and practice of exceptional promise, in scientific and economic results, as related to a wide range of human interests.

The general results of this study of an intercontinental problem in bioclimatics should leave little or no reasonable doubt as to the fact of, and prevailing responses represented by, the bioclimatic law. Neither should there be any doubt as to its practical application to almost any problem in any branch of natural science which involves a consideration of the responses of living organisms and climatic elements to continental, regional and local influences, or to problems that require a measure of the relative intensity of the factors of variations as related to periodical manifestations and geographical distributions.

BIOCLIMATICS.—*Bioclimatic zones of the continents; with proposed designations and classification.*[1]—ANDREW D. HOPKINS, Bureau of Entomology.

The Major Zones are the Frigid, Temperate and Tropical, designated as Majors I, II, and III. These majors are divided into Minor Frigid, Minor Temperate, and Minor Tropical, and are designated by Arabic numerals, as follows:

I. Major Frigid Zone.—Arctic and Antarctic, and Alpine, with Minor Frigid 1, 2, 3 and 4 from the poles and from higher to lower altitudes.

[1] In connection with the author's address at the joint meeting of the ACADEMY and Biological Society (see the preceding article) these designations and classification of bioclimatic zones for the continents of the world were suggested. (Received April 12, 1921.)

II. Major Temperate Zone.—South and north of and below Major I with Minor Temperate 1, 2, 3, 4, 5, 6, and 7. South and north of and below Minor Frigid 4.

III. Major Tropical Zone.—South and north of and below Major II, with Minor Tropical 1, 2, 3, and 4. South and north of and below Minor Temperate 7.

This suggested system of designations and classification of the zones is put forward with the idea of replacing names based on geographical features or political divisions of one country, continent, or hemisphere with designations that would be applicable to any continental or insular area of both hemispheres.

The Minor Temperate 1 to 7, Minor Frigid 4 and Minor Tropical 1, are wholly, or in part, equivalent to the Merriam life zones as related to North America. Thus:

Minor Frigid 4 = Merriam's Boreal or Arctic-Alpine.

Minor Temperate 1 = Hudsonian; 2 = Canadian; 3 = Transition; 4 = Upper Austral and Upper Sonoran in part; 5 = Lower section of Upper Austral, Sonoran and Carolinean and upper section of Lower Austral, Lower Sonoran and Austroriparian, and represents a transition between 4 and 6; 6 = Lower Austral and Sonoran in part; and 7 = Gulf strip as a transition between Minor Temperate 6 and Minor Tropical 1 which latter = Merriam's Tropical.

The range and limits of the minor zones are characterized primarily by certain average ranges of temperature and, as related to world distribution, may be designated as terrestrial thermal zones. Each Minor Zone may embrace in its world-wide range many types of climate and life peculiar to certain regions, local areas and places. Therefore, while their numerical designations and relations are maintained throughout, each minor is subject to division into many recognizable sections and subsections; each characterized by some peculiar regional or local conditions as to life, climate, weather, and physical adaptation of the land to various types and associations of life.

In general the position occupied by a given place may represent the upper, middle, or lower section of a zone designated as follows: (—) lower, (—.) lower middle, (.) middle, (+.) upper middle, (+) upper; and (— +) the lower of one and upper section of another or the colimits of two zones, as (— 3 + 4) = lower 3, upper 4.

The index or characterization elements of the minor zones and their subdivisions into sections are many and varied. Some of the principal ones are the thermal index; life type and ecological index; the

isophane and altitude index; and the phenological index; each modified by topographic, geologic, soil, and other features so as to define local subdivisions, even down to specific places only a few rods or feet in extent which may represent an element or feature of distinction.

When we learn to recognize and properly interpret these various guides to the major and minor features of a bioclimatic zone, it will be an easy matter to determine not only what zone is represented by a given region and section of the country, but what section or minor element of a zone is represented by a given place on a given farm. Then we will realize all and far more than Dr. Merriam and others have claimed for the life zones as guides to the development of human welfare in food, health, and prosperity.

BOTANY.—*Two new species of* Bursera.[1] HENRY PITTIER.

The two new species of *Bursera* here described have been found by the writer in the course of study of the Central American material of this genus in the United States National Herbarium.

Bursera panamensis Pittier, sp. nov.

Low tree or shrub; branchlets short, thick, glabrous, grayish; leaves pinnate, small, the rachis pubescent, 1 to 4 cm. long, narrowly winged between the two lower pairs of leaflets, more broadly so between the upper pair; leaflets 5 to 9, subcoriaceous, sessile or almost so, ovate to ovate-lanceolate, the lateral ones rounded, the terminal one acute at base and apex, serrate and slightly revolute on margin, sparsely hairy above, grayish tomentose beneath; flowers unknown; fruiting racemes pubescent, 2 to 3 cm. long, sparsely branched; drupes pedicelled, glabrous, subglobose, 6 mm. long, the pedicels 5 mm. long, bearing at the apex the persistent calyx.

Type in the U. S. National Herbarium, no. 715171, collected near the salt works at Aguadulce, Province of Coclé, Panama, December 6, 1911, by H. Pittier (no. 4993).

This species belongs to the group of *Bursera tomentosa* (Jacq.) Tr. & Pl., with pedicellate flowers and membranous, serrate or crenate leaflets, these more or less hairy on both faces. It is called "almácigo de cruz" by the natives of Aguadulce. The fluid oleo-resin which distils from the trunk and the decoction of the young leaves are popular medicines, the first being used as a calmant and the latter as a diuretic.

Bursera verapacencis Pittier, sp. nov.

Small tree or shrub; branchlets short, at first densely hairy; leaves clustered at the ends of the branchlets, alternate, bipinnate at the base, pilosulous above, densely brownish-hairy beneath, up to 5 cm. long and 4 cm. broad, the rachis very slender and narrowly winged; pinnae and leaflets 17 to 23, the former 6 to 10, each with 7 to 11 pairs of leaflets, these sessile, ovate or oblong, entire, rounded at the base, subacute at the apex, 2 to 8 mm. long,

[1] Received February 11, 1921.

1.5 to 4 mm. broad; racemes axillary, few-flowered, up to 3 cm. long; flowers unknown; drupes pedicellate, globose, about 5 mm. long, glabrous, the rachis of the racemes hairy, the pedicels 3 mm. long.

Type in the U. S. National Herbarium, no. 858,992 collected between Salamá and Rabinal, Baja Verapaz, Guatemala, May 31, 1904, by O. F. Cook and C. B. Doyle (no. 283).

This species is closely allied to *Bursera gracilis* Engler, but differs in the greater number of pinnae and leaflets, in the hairiness of the latter, and in having the racemes much shorter than the leaves.

ZOOLOGY.—*The selection of family names in zoology.*[1] W. L. McATEE, Biological Survey. (Communicated by S. F. Blake.)

The principles upon which the names of families and higher groups in zoology shall be selected have not received much attention, chiefly, no doubt, for the reason that the problems of genera and species have been more pressing. Indeed before action can be taken by the International Zoological Commission (presumably to be reconstituted) it is highly desirable, if not necessary, that there shall be some crystallization of opinion on the point among zoologists.

The leading Codes of Nomenclature have little to say upon the subject, the most explicit rule being found in the Stricklandian Code of 1842.[2] It states that families should be named for "the earliest-known or most typically characterized genus in them." The A. O. U. Code, 1886, says that such names "take the tenable names of some genus, preferably the leading one." The Paris-Moscow Code, 1889–92, states that family names are formed on "the root of the genus serving as the type," a remark paraphrased in the International Rules (1913) as "the stem of the name of its type genus."

The A. O. U. provision is intentionally vague; those of the last two codes mean nothing unless they are intended to be understood in the sense of the Stricklandian canon. Since, with the exception of the words "earliest-known" in the latter rule, none of these codes specifies a method of selecting "typical" genera of families, nor states what the preference shall be among competitors for the rank, references in them to the selection of family names are practically meaningless.

[1] This paper, prepared in its original form in 1918, was laid aside on the principle of "letting sleeping dogs lie," but recent contributions in Science showing the slumber to be effectually broken, a little more disturbance should do no harm. (Received March 2, 1921.)

[2] To save time reference is made to *N. A. Fauna*, No. 23, pp. 722–3 (1904), where Dr. T. S. PALMER has quoted, with references, the code clauses relating to family names.

Recently a set of rules has been proposed in *Science*,[3] the most important requirement of which is that "The type genus of a family or subfamily is the included generic group from the name of which the family or subfamily name was originally[4] formed, and is to remain the type genus irrespective of changes in its name." In other words, the name of the family changes with every change in that of the so-called type genus. Thus if a family or subfamily name had been based on the genus to which the rose-breasted grosbeak is assigned, in following all of the mutations of its type genus it would have been changed to conform with the 5 generic names listed hereunder, during the period that family names have been generally used in ornithological nomenclature: Guiraca, Hedymeles, Goniaphaea, Habia, Zamelodia; and in earlier periods the species has been referred to at least 5 additional genera. The writer does not undertake to say whether or not this is an extreme case; at any rate it illustrates how the system might work.

The opposed method of selecting family names is basing each upon that of the oldest included genus. If for any reason the oldest name becomes unavailable the next oldest is used, and so on. It stands to reason that if the bases of family names are exclusively the oldest generic names, there will be fewer nomenclatorial casualties than if any later names are used. For the more recent the name the more likely it is to prove a homonym or synonym.

In the absence of definite rules on the subject, how has the selection of family names worked out in actual practice in zoology? Unquestionably the general practice has been to use family names based on the earliest available generic names. Whether they were deliberately selected from this point of view may be questioned, but the evidence is strongly that way, for as will be pointed out in the sequel the chances of general agreement upon family names having priority in themselves are very remote. To illustrate usage in the selection of family names we may cite the "Index Generum Mammalium,"[5] in which 159 of the accepted names are based on the oldest generic name (not preoccupied) or upon one of a group of names of the earliest year date, while 34 (chiefly of fossil groups) are not. Of the total

[3] Science, N. S. 52: 142–147. Aug. 13, 1920.

[4] Discussion later in this paper shows that it is by no means easy to decide where and when the family name was "originally formed." Priority in family names is not the comparatively simple matter that it is in generic names.

[5] T. S. PALMER, *N. A. Fauna* 23. 1904.

number of accepted family names 157 also have priority as such among family names cited in the work, which include only those originally published in approved classical form, but it is interesting to note that of 33 "oldest"[6] family names not used, 22 are displaced by names based on the oldest genera. In 3 cases the "oldest" family name based on the oldest genus is not accepted.

Of the family names of birds used in the A. O. U. check-list[7] 63 are based on the oldest generic name, while 7, or possibly 8, are not. Without going into the matter statistically, the writer feels justified in stating that in entomology it has been a very general practice to found family names on those of the earliest available genera.[8]

The earliest genera certainly deserve consideration as bases for group concepts, if for no other reason than that they represent the first attempts to segregate groups in the families involved. Genera were established before families and the older among them, in many cases, had as broad scope as modern families. After decades upon decades of effort, priority in generic names is now pretty well worked out and family names founded in each case on the oldest available generic name will be little subject to change. Working on this basis, we have a system that comprehends both the original selection of the name and its replacement if necessary.

Under the type-genus system replacement of a family name is provided for, as the name once selected follows that of the type genus in all its mutations. But what of the original selection? In brief, the proposal is that the earliest family name shall be selected. What does this mean? In view of the facts of nomenclatorial history and practice, it means that every supergeneric group name (based on that of a genus) proposed since 1758 must be taken into consideration. These names for the most part have never been catalogued, and discovering priority among them no doubt would take years of research. Does it not seem we are invited into a new nomenclatorial game in which for years and years when the question is asked, "Who has the oldest name for this family?" there will pop up here and there zealous bookworms each shouting "I have it," each "I have it" portending a change in family nomenclature?

[6] Quoted because names cited in the work do not include vernacular and other names that are available for choice in selection of family names.

[7] *Check-list of North American birds.* American Ornithologists' Union. Third ed. (revised), 430 pp. 1910.

[8] *The Entomological Code* (NATHAN BANKS and A. N. CAUDELL, 1912, p. 22,) rules that the root-genus for a family name should be "preferably the oldest."

In the search for earliest family names the following difficulties, among others, will be encountered. Names based on those of genera are understood in each case.[9]

1. Family nomenclature as such was not in general use until more than 50 years after the *Systema Natura;* therefore what are now considered distinctive endings need not be looked for in the earlier names of supergeneric groups; names of whatever endings will have to be considered.

2. Rank of supergeneric groups was not always indicated and certainly cannot be closely correlated as between diverse authors. Families and genera of various authors equal in scope modern orders and families. Names of every rank will have to be considered. Any name for a group agreeing chiefly in composition with one that now is, or shall in future be, considered of family rank is on the eligible list. Opinion will enter largely into the decision as to whether there is a sufficient degree of coincidence.

3. It is impracticable to choose between names set forth in the formal language of science and vernacular names. Van Duzee, who is quoted as a disciple of priority in family names and of the type-genus method, says: "It was my intention to follow Dr. Horvath's scheme in all its details but as the work advanced it was found necessary to abandon his plan to discard all names not strictly in latin form. His method would have thrown out a large number of groups founded by Amyot and Serville in their great work which is really the foundation of all our modern classification of the Hemiptera."[10] Here it may be added that in numerous well-conceived systems the family and higher groups were given vernacular names only; indeed, in some cases only numbers were used.

As between a family or subfamily name in classical form and properly used, a scientific-appearing name casually used, a vernacular name appearing in an evidently good system, and a vernacular simply in text, who is to be the arbiter? and who will accept his judgment?

4. It would appear that names of whatever form, whatever rank, whatever language, wherever proposed, in fact every supergeneric

[9] This restriction is necessary of course on account of the *ex post facto* rules in modern codes relating to the formation of family names. Many names not based on generic names have been used for supergeneric groups, which in other respects are as logical and worthy of consideration as those embodying generic stems. Such names are available for suborders and higher groups but for families, never. Our system of priority is indeed garnished with many an exception.

[10] *Check-list of the Hemiptera . . . of America north of Mexico,* pp. vi–vii. 1916.

name since 1758[11] must be taken into consideration in the selection of family and subfamily names on the basis of intrinsic priority. A great part of these have never been catalogued; who is to do it? and how long will it be until we shall be reasonably secure against the resurrection of names which may supersede a family name anywhere in the system? Under this plan would not the way be opened up for an indefinite number of changes in family and subfamily names?

Will we not be much better off if we base our family and subfamily nomenclature upon a set of names, the priority in which is already almost completely worked out, than to adopt a rule compelling us to search out priority in another set of names hitherto largely neglected by bibliographers, and in which the problems to be met are more complex and confusing even than they are among genera?

In other words, the present view is that due to inevitable difference of opinion as to whether only latinized names of subfamily and higher groups shall be considered, or whether vernaculars shall be included; as to what are classical forms and what vernacular; as to whether all supergeneric names, regardless of the rank given by their proposers, shall be considered; and as to whether the groups defined agree well enough in scope with modern concepts—differences of opinion, we would repeat, as to all these controversial points, would seem to block attainment of real priority in subfamily and family names. If substantial justice cannot be done, and this would further appear certain because of the necessity of ignoring numerical systems and the probability that vernacular-named subfamily and family groups even if considered would not receive consistent treatment, why would it not be better to record attempts at higher classification, formal and informal, only in technical taxonomic discussions and not try to convey this history in connection with the names themselves?

We can fix family names by an automatic process, that of basing them on the oldest included genera. Authorities for the names (seldom cited under present practice) would of course be unnecessary, but credit or responsibility for family and subfamily groupings could be separately recorded and include not only the more modern *pro forma* efforts, but also the earlier ones, however crude.

With choice between an automatic method having nearly clear sailing ahead, and another beset by the complications as to priority here

[11] Unless indeed some other date be selected for the beginning of family nomenclature; substantial agreement upon which probably could not be obtained.

alluded to, there would seem to be no reason for hesitation, unless thorough-going application of the former method should involve an entirely disproportionate number of nomenclatorial changes.

As evidence on that score it may be said that if 159 out of 193 family names in a standard work on mammals and 63 out of 71 in another on birds are now based on the oldest genera (and undoubtedly these are fair samples), the percentage of change required to bring all family names into agreement in this respect is by no means appalling. On the other hand, the search for priority among possible family designations has hardly begun and we know not through what nomenclatorial upheavals pursuit of that policy might lead us.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

GEOLOGY AND HYDROLOGY.—*Geology and ground waters of the western part of San Diego County, California.* ARTHUR J. ELLIS and CHARLES H. LEE. U. S. Geol. Survey Water-Supply Paper **446.** Pp. 321, pls. 47, figs. 18. 1919.

The report treats of the physiography, geology, and ground-water resources of that part of San Diego County, Calif., which is drained directly into the Pacific Ocean, and includes a geologic map of this area. This region consists of a mountainous highland area, and a narrow belt along the shore characterized by broad flat-topped sea terraces. The mountains of the highland area are believed to be due principally to erosion, but differential crustal movements have also been largely effective in mountain building.

Comparatively flat tracts, or "highland basins," some of them surrounded by steep mountain walls, cover many square miles within the highland area. These tracts lie in three belts parallel to the trend of the main drainage divide, and may be remnants of a peneplain, many other remnants of which are preserved as flat-topped mountains. Several faults, presumably of considerable magnitude, have been identified, and numerous others are suggested by topographic evidence.

The drainage pattern shows a tendency for the streams to follow parallel courses and to make rectangular changes of direction. The drainage basins are unsymmetrical. There are places in all the principal valleys where the bed-rock floor is deeply buried beneath detritus, and several of the principal streams, after crossing deep valley fill, flow through narrow rock-bottomed gorges.

Repeated submergence and emergence has been the dominant factor in the development of the physiographic features of the coastal belt. These features comprise several extensive and numerous small sea terraces, ranging in elevation from 20 to 1200 feet above sea level, and dissected by streams to depths as much as 200 feet below the present sea level. The major valleys in the coastal belt have wide, flat, gently sloping floors, bordered by very steep slopes or bluffs several hundred feet high. They contain deposits of valley fill as much as 200 feet in depth.

The geologic formations exposed in the highland comprise igneous and metamorphic rocks most of which are considered to be post-Carboniferous and not younger than early Cretaceous. Thick deposits of Quaternary alluvium occupy parts of the principal river valleys. In the coastal belt, sedimentary formations ranging in age from Cretaceous to Recent are exposed. Undifferentiated Miocene and Pliocene deposits, parts of which have been referred to in earlier literature as the San Diego beds, are designated as the San Diego formation.

The portion of this report prepared by Charles H. Lee treats of the groundwater hydrology of the shallow water-bearing formations of the Pacific Slope of the county, and the utilization of ground water from these formations Complete precipitation records at 106 stations and a detailed map are presented. Conclusions are drawn regarding the amount of rainfall in any season necessary to produce run-off and also the relation of rainfall to run-off. Evaporation observations are given and comparison made between evaporation from a pan floating on a large reservoir surface, and the reservoir surface itself, which indicate that there is little difference between the two. Data regarding soil evaporation and transpiration from mixed natural vegetation are also given.

Detailed physical descriptions are given of the largest ten underground reservoirs of the region lying in the principal river valleys, with detailed geological and other data. The conclusion is drawn that ground water in the San Diego County river valleys has very little movement and seldom occurs as underground streams, but occupies underground reservoirs. Similar data are also presented for other underground reservoirs of the region.

Tests of existing pumping plants of various types are presented, which, for working conditions on the farm, show pump and pumping-plant efficiency and cost of pumping for irrigation. The selection and installation of pumping machinery are also discussed. A. J. E. and C. H. L.

GEOLOGY.—*The origin of the faults, anticlines, and buried "Granite Ridge" of the northern part of Mid-Continent oil and gas field.* A. E. FATH. U. S. Geol. Survey Prof. Paper **128-C.** Pp. 10 (75–84), pls. 3, figs. 3. 1920.

The paper is an attempt to find a common cause for the more or less parallel or continuous alinement in a general N.-NE. direction of the buried "granite ridge" of Kansas, certain larger folds, and a line of en echelon faults in Oklahoma and Kansas. Beginning with the discussion of the belts of faults the author assumes that the Pennsylvania strata would be incompetent to transmit the stresses which produced the faults but that the deeper-lying rocks from the Mississippian limestones down into the pre-Cambrian would be. He shows that horizontal movement along deep-lying faults coinciding in position and direction with the belts of en echelon surface faults could produce them. He also shows that folds and lines of folds might result from vertical move-

ment along such deep faults, but admits that the folds in the region considered have characters which could not be accounted for in this way. The "granite ridge" which is overlain directly by Pennsylvanian rocks must have originated in late Mississippian or early Pennsylvanian time, perhaps by movement along one of these deep-lying faults. Successive movements along these lines at distinct periods have resulted in different effects at different depths. The origin of the assumed deep-lying faults is ascribed to pre-Cambrian mountain-building movements, as all subsequent movements in this Mid-Continent region are considered inadequate to have produced them. M. I. GOLDMAN.

GEOLOGY.—*The Lance Creek oil and gas field, Niobrara County, Wyoming.* E. T. HANCOCK. U. S. Geol. Survey Bull. **716-E.** Pp. 32 (91–122), pls. 4. 1920.

The Lance Creek field lies in east-central Wyoming, west of the Hartville uplift which connects the Rocky Mountains and the Black Hills. It is probably separated from that uplift by a broad syncline. Cretaceous and Tertiary formations from about 1660 feet below the top of the Cretaceous Pierre shale up to the Tertiary White River formation and Quaternary alluvium are exposed. The sinuous anticline from which oil and gas are being obtained, as represented on a map by 100-foot contours, has a dominant east-west trend but turns north at its east end and south at its west end. The total length of the axis is probably about 20 miles, the closure of the anticline about 1,000 feet. The north and west flank is steep with dips up to 27° but on the south flank the dips run from $2^1/_2$° to 5°.

Production is being obtained from what the author considers the Newcastle sandstone about 200 feet above the Dakota sandstone, around 3,500 to 4,000 feet below the surface. The yield of the principal wells ranges from 250 to 2,500 barrels of oil and from 8 million to 30 million cubic feet of gas per day. The author suggests testing deeper beds at least to include the Jurassic Sundance formation which he estimates could be reached, by a well located on the top of the anticline, at a depth of about 4,200 feet. He also draws attention to the possibility of production from the Wall Creek sandstone which lies about 1,050 feet above the Newcastle sand. M. I. GOLDMAN.

ENTOMOLOGY.—*The colonizing reproductive adults of termites.* T. E. SNYDER. Proc. Ent. Soc. Wash. **22:** 110–150. 1920.

This paper, which was presented to the Faculty of the Graduate School of George Washington University as part of the requirements for the degree of Doctor of Philosophy, summarizes the literature and the author's extensive field notes of the colonizing habits of the reproductive adults of white ants. The three types of reproductive forms are discussed in detail, the nymphs characterized, and methods of colonization described. The results of the breeding experiments and attempts at cross-breeding are set forth. A summary of the paper and conclusions drawn is given and the article concluded by a list of the literature cited. S. A. ROHWER.

ENTOMOLOGY. *The subfamilies of Formicidae, and other taxonomic notes.* WILLIAM MORTON WHEELER. Psyche **27:** 47–55. Figs. 3. 1920.

This short paper gives a phylogenetic tree of the various subfamilies of ants. It also includes descriptions of new genera and subgenera and some remarks on the digestive system. S. A. ROHWER.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

PHILOSOPHICAL SOCIETY

843D MEETING

The 843d meeting of the Philosophical Society of Washington was held in the Cosmos Club, December 18, 1920, with President FARIS in the chair, and 52 persons present.

The first paper was by R. W. G. WYCKOFF, on *The determination of the structure of crystals*, and was illustrated with lantern slides.

An outline of the development of the methods thus far used serves to show the point of view from which the studies of the arrangement of the atoms in crystals have been carried out. The essential steps in this development are the experiments of Laue and of the Braggs, the determination of the arrangement of the atoms in some one crystal and the consequent measurement of the absolute wave lengths of X-rays. In nearly all of the structures which have been studied a procedure based upon the point of view of these experiments has been followed. This procedure consists in getting a limited amount of experimental data with the aid of one of the three existing methods of obtaining diffraction effects—the Laue method, the spectrometer method or its modification, and the method of powders. Bearing these experimental facts in mind, the analyst has tried to imagine some arrangement of atoms which will explain them. If he has succeeded in devising such a grouping, it is considered to be the structure of the crystal. This method of procedure is both cumbersome and haphazard and there is no means of knowing whether many other ways of arranging the atoms of the crystal under examination do not exist, all equally capable of explaining the data.

This method is to be contrasted with the general method for studying the structure of crystals which can be built around the theory of space groups. The results of this geometrical theory can be given an analytical representation which states in terms of suitable coordinates all of the positions in space that atoms in crystals can occupy. With its aid, and knowing the crystallographic symmetry, it is thus possible to write down in the case of any particular crystal, independently of any X-ray experimentation, all of the ways in which the atoms can be arranged. Suitable calculation will give the kind of diffraction effects to be anticipated from each of these possible arrangements of atoms. The experimenter may then obtain, by whichever of the various methods will yield the desired information most readily, those data which the calculations show to be necessary to distinguish between the possible atomic groupings.

The second paper, by I. G. PRIEST and MABEL K. FREHAFER, on *The optical basis of Bittinger's camouflage paintings*, was presented by Mr. Priest, and was illustrated with slides and with examples and copies of the paintings.

Viewed in daylight, or any illumination approximating to this, these paintings appear no different from other paintings of the same kind; but if viewed through a red glass, or in red light, the aspect of the picture is changed materially. A picture of the sea, with a wave breaking, shows under the red illumination, a mermaid rising from the wave. A summer scene in which

are depicted a tree and a house, beside a dam, is transformed by the change in illumination into a winter scene, with ice and snow. In another, the smoke screen from a battleship shows concealed a large American flag, and the inscription, "Victory." The picture of an airplane bearing a cross, the German insignia, shows up the concealed circle, insignia of the Allies. The portrait of a lady is completely transformed by the red light, into a landscape, with a horse and man in the foreground.

The explanation of these effects lies in the two kinds of paints that Mr. Bittinger uses. Any pair of these pigments is very well color-matched in daylight, that is, there are two dark greens, two light greens, two lavenders, etc. But one pigment of each pair reflects a considerable amount of red light, so that in red light one is a highlight and the other a shadow. In any painting the two color-matched pigments are applied, side by side; but that of high reflecting power in the red is so manipulated that a complete picture in this kind of paint is produced which is visible as such only when the ordinary pigments are darkened by the use of the red light.

Experimental demonstrations of the above phenomena were made. The spectral reflection curves of the several paints as determined at the Bureau of Standards were shown by lantern slides. These curves have been published in the *Journal of the Optical Society of America*, September, 1920, p. 391.

The third paper, by I. G. PRIEST, on *A relation between color and spectral distribution of light*, was also illustrated with slides.

In a study of colors of the same quality evoked by stimuli of different spectral distributions the following rule has been found to hold: If any two lights, however different in spectral distributions, evoke colors of the same quality the wave lengths of the centers of gravity of their spectral distributions are coincident.

This paper has been published in the *Journal of the Optical Society of America*, September, 1920.

The last two papers were discussed by Messrs. SILSBEE, TUCKERMAN, WHITE, LLOYD, FERNER, and SOSMAN.

844TH MEETING

The 844th meeting was held in the Cosmos Club, January 15, 1921, with President FARIS in the chair, and 58 persons present.

The address of the evening was by the retiring President, ROBERT B. SOSMAN, on *The distribution of scientific information.*

The paper was discussed by Messrs. PAWLING, C. A. BRIGGS, FERNER, WHITE, BROOKS, CRITTENDEN, HUMPHREYS, WRIGHT, WILLIAMSON, BURGESS, WATSON DAVIS, and others. It has been published in full in the *Journal of the Washington Academy of Sciences.*[1]

845TH MEETING

The 845th meeting of the Society was held in the Cosmos Club, January 29, 1921, with President FARIS in the chair, and 47 persons present. The following program was given:

G. BREIT: *The distributed capacity of inductance coils.*

The distributed capacity of inductance coils affects their behavior in electrical circuits. It changes the effective resistance and inductance of inductance coils. It is important for the radio engineer to be able to predict from the construction of the coil the influence of its distributed capacity. The

[1] This JOURNAL 11: 69–99. February 19, 1921.

paper dealt with the principles underlying the calculation of the effects of the distributed capacity and with the experimental verification of the calculation of these effects.

One of the effects due to the distributed capacity is the change in the apparent inductance of the coil. This change may be shown to be due to the fact that the current distribution in the coil is not uniform. On this basis a calculation of the apparent inductance was made and hence the "effective capacity" of a coil was derived.

Similarly the resistance of a coil was discussed. On account of the non-uniform current, distribution based on the definition of resistance used for the case of uniform current-distribution becomes inapplicable. The resistance of the coil is redefined in such a way that it can be determined experimentally and used to calculate the current in the coil when the coil is placed in a known electric field. The experimental verification of the conclusions derived was discussed.

A considerable portion of the distributed capacity of a coil is due to the capacity of the coil to ground. This capacity manifests itself when two condensers are used in series with each other and with the coil. The assumptions underlying a theory of these phenomena were discussed and the theory was shown to be verified experimentally.

J. H. DELLINGER and L. E. WHITTEMORE: *Radio signal fading phenomena* (presented by Mr. DELLINGER, and illustrated).

When radio first began to be used for long-distance communication it was noticed that signals were not transmitted as far during the day as during the night-time. It has also been observed that night signals using the shorter radio waves vary greatly in intensity from minute to minute.

More recently, since radio direction finders have come into use, it has been learned that great variations may occur in the direction of radio waves as they arrive at the receiving station during the transmission of signals from a given transmitting station.

These and related phenomena have been recorded from time to time in the literature, and various hypotheses have been brought forward in explanation. The phenomena are dependent upon a large number of variable quantities, such as the weather conditions, the nature of the country over which transmission occurs, the surroundings of the transmitting and receiving stations, and the method of handling the receiving apparatus. Only by a statistical study in which the results obtained simultaneously at a large number of receiving stations are collected and tabulated may reliable averages be obtained.

Such a cooperative study is being carried on by the American Radio League and the Bureau of Standards, tests being conducted in June and October, 1920, and January and April, 1921. In these tests from five to ten radio stations transmit signals in succession. These signals are received simultaneously at about one hundred receiving stations whose operators are provided with forms for recording the variation in the intensity of the signals as received.

The paper described the results of the tests so far conducted and proposed an explanation of the phenomena. This explanation associates the long-distance radio transmission accomplished at night with the boundary of the highly conducting outer portion of the atmosphere, which is also the origin of auroral disturbances. Fluctuations in intensity are probably caused by irregular absorption of the waves by masses of slightly ionized air through

which the waves travel in their course. The "fading" phenomena are closely associated with the strays or atmospheric disturbances which affect all radio communications. This paper will be published in the *Journal of the Washington Academy of Sciences*.

F. B. LITTELL: *The variation of latitude and the constant of aberration from four years' work with the photographic zenith tube at Washington.*

A brief account was given of the principles of the photographic zenith tube devised by Dr. F. E. ROSS. The average probable error of a single latitude for the four years 1916–20 was ±0.089 second. A curve was shown giving the path of the North Pole as deduced from a combination of the results of the Washington observations with the results of observations made at Greenwich with the Cookson photographic floating zenith telescope.

A value for the constant of aberration of 20.454 ± 0.008 second was deduced from the observations, and curves showing the Kumiro or z-term for the years 1916 and 1917 were shown. An analysis of the meteorological conditions showed that the z-term could not be accounted for by the barometric gradients.

This paper will appear in full in the *Astronomical Journal*.

Dr. R. S. WOODWARD characterized the subject as most important; and regretted that there was not time for its full discussion.

H. H. KIMBALL, *Recording Secretary.*

BIOLOGICAL SOCIETY

617TH MEETING

The 617th regular (41st annual) meeting of the Biological Society of Washington was held in the lecture hall of the Cosmos Club on December 11, 1920, with President A. D. HOPKINS in the chair and 28 persons present.

It was announced that on May 15, 1920, the resignations of N. DEARBORN as Treasurer and A. WETMORE as Corresponding Secretary were received, and that F. C. LINCOLN became the new Treasurer and T. E. SNYDER the new Corresponding Secretary.

Reports of officers and committees were received, and officers and members of the council were elected, as follows:

President, N. HOLLISTER; *Vice-Presidents*, A. S. HITCHCOCK, J. W. GIDLEY, S. A. ROHWER, H. C. OBERHOLSER; *Recording Secretary*, A. A. DOOLITTLE; *Corresponding Secretary*, T. E. SNYDER; *Treasurer*, F. C. LINCOLN; *Members of the Council*, WM. PALMER, E. A. GOLDMAN, H. H. T. JACKSON, R. E. COKER, R. W. WILLIAMS.

618TH MEETING

The 618th meeting of the Society was held in the lecture room of the Cosmos Club at 8.10 p.m. on January 8, 1921. President N. HOLLISTER called the meeting to order with 62 persons present. On recommendation of the Council, Mr. E. G. RUNYAN was elected to membership.

The President announced the following committees: *Committee on Publications*, C. W. RICHMOND (Chairman), J. H. RILEY, T. E. SNYDER, F. C. LINCOLN. *Committee on Communications*, S. A. ROHWER (Chairman), C. E. CHAMBLISS, J. S. GUTSELL.

Informal communications

J. M. ALDRICH exhibited dried specimens of caterpillars of *Coloradia pandora* Blake, which are used as food by Indians in the vicinity of Mono Lake, California. The species has a two-year cycle. Feeding on the Jeffrey pine

as larvae, they descend at the end of the second summer to pupate. They are then caught, and thrown into a pile of hot earth. After partial cooking they are dried in the shade, and thereafter will keep indefinitely. The specimens shown were eleven years old. There is but one brood, and caterpillars can be taken only in alternate years.

Mr. DAVID FAIRCHILD spoke upon the edibility of certain borers with which he had experimented.

Prof. A. S. HITCHCOCK reported progress toward agreement among the various botanical codes. The desire is to unite the American and Vienna Codes and to agree upon the principle of types.

Regular program

L. O. HOWARD: *Some views of the fight in southern France last summer against the Moroccan locust.* (Illustrated.)

This locust lives all around the Mediterranean coast, and at times is threatening to vegetation; it was especially so in 1920 in southern France in the sheep pastures. The government detailed soldiers to assist farmers in the campaign against the locusts, the farmer furnishing lodging, food, and all materials. In early morning when the locusts were comparatively sluggish, they were driven to the center of the fields where a flame was played over the mass of insects. A poisoned mash could not be used on account of the scarcity and expense of materials. Views were shown of the farm quarters, the fields and locusts, and the methods of fighting the insects.

Dr. Howard also availed himself of the opportunity to visit the home of HENRI FABRE, at Avignon. The home is kept by one of his daughters exactly as left by Fabre at his death, five years ago. Fabre was very active to the time of his death, and in his garden there remain many plants which he brought from the Alps. Views of the house, garden, and the medal which was struck in commemoration of the esteem in which Fabre is held by the French were shown.

S. F. BLAKE: *Sexual differences in coloration of the spotted turtle.*

This paper will appear in full in the *Proceedings of the U. S. National Museum*. It was discussed by Drs. SHUFELDT and HOWARD.

A. A. DOOLITTLE, *Recording Secretary*

BOTANICAL SOCIETY

149TH MEETING

The 149th regular meeting of the Botanical Society of Washington was held in the Assembly Hall of the Cosmos Club at 8 p.m., February 1, 1921, with 118 members and guests present, and President CHAMBLISS in the chair. Among the guests were: Prof. H. W. ANDERSON, of the University of Illinois, Prof. F. D. FROMME, of Virginia Polytechnic Institute, Prof. J. F. COLLINS, of Providence, R. I., Dr. RUDOLPH KURAZ, Secretary, Czechoslovak Legation, Dr. DOBROSLAV TODOROVIC, Agricultural attaché from Serbia, and Mr. SOREN SORENSON, Agricultural attaché of Denmark. Mr. JOSEPH W. WELLINGTON was elected to membership.

Brief Notes and Reports of Literature

Dr. C. L. SHEAR called attention to an article in *Science* concerning the formation of a committee of 14 by the British to aid men of science in Russia, the main idea being to provide literature for Russian scientists. The meeting instructed the Executive Committee to give attention to the matter of providing scientific literature to Russian scientists, and instructed the So-

ciety's representative, Dr. HITCHCOCK, to bring this to the attention of the Washington Academy of Sciences.

Mr. PIERCE called attention to the series of articles by Dr. JOHN HARSHBERGER, which began to appear in the October, 1920, number of the *Garden Magazine* on *Old gardens of Pennsylvania*. These articles dealing with the early botanists of Pennsylvania and their collections should be of interest to all students of botanical history.

Mr. LEWTON called attention to the new edition of Dr. MARCELLE HARDY'S *Geography of plants*, a copy of which was passed around for inspection.

Regular program

H. L. SHANTZ: *Natural vegetation of Africa.* (Illustrated with lantern slides.)

The vegetation of Africa ranges from the absolute desert of the southwest coast and portions of the Sahara, through desert shrub, desert grass, desert grass and acacia, and acacia tall grass to the great tropical savannas and in the Congo basin to the tropical rain forests, as higher elevations, mountain grass land and mountain forests appear. The distribution of these more important types was outlined and the agricultural potentiality of the land occupied by each type discussed and compared with somewhat similar types in the United States. Much of Africa is high, cool and dry, and is occupied by desert or semi-desert types, and only a relatively small portion by tropical jungles. The more important agricultural crops are corn, cassava, grain sorghums, bananas, beans and rice.

IVAR TIDESTROM: *Notes on the flora of the Iberian Peninsula.* (Illustrated with lantern slides.)

The flora of the Iberian Peninsula is richer in species than any other of the European floras. The reason for this great wealth of species is the geographical position of Spain, the high elevation of the land surface above the sea-level, the various mountain ranges, and the proximity to Africa.

The littoral from Lisbon to Valencia, including the valley of the Guadalquivir, is semi-tropical, and appears to be analogous to the Pacific Coast region from San Francisco southward to Arizona, including the valleys between the Coast Range and Sierra Nevada. The Castilian and North African plateaus have a great number of plants in common, which fact tends to prove that there was a land bridge between the two continents at some remote time—a fact already noted by paleontologists.

The meteorological conditions of these plateaus show resemblances to those of the southwestern United States where the minimum temperature does not fall below —17° C. The general aspect of the plateaus and mountains is that of our western country, and the types of plants are similar. The upper belts of the mountains in Spain have a northern flora typical of the aspen, spruce, and alpine belts of the Rocky Mountains and Sierra Nevada.

The cultivated plants of Spain thrive equally well in our southwestern states. Of the trees in cultivation, the Lombardy poplar is the most interesting. Community planting of this tree has been attempted in northern Spain, where plantations now exist for the purpose of supplying timber and pulp.

R. G. PIERCE, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

Messrs. WILLIAM BOWIE and H. G. AVERS went to Ottawa, Canada, in March, to consult with the superintendent of the Geodetic Survey of Canada in regard to the coordination of precise-level nets of the two countries. It is proposed that the two nets be adjusted together in order that the elevations on the boundary may agree in the maps and reports published in the two countries.

Prof. F. W. CLARKE of the U. S. Geological Survey, and Dr. H. S. WASHINGTON of the Geophysical Laboratory of the Carnegie Institution of Washington, have been elected Fellows of the Geological Society of London.

Messrs. HIPPOLYTE COPAUX, of the School of Industrial Physics and Chemistry of Paris; PIERRE LELAUDOUX, of the Tunisian Phosphate Company; EUGENIO DONEGANI, of the Sicilian Sulphur Company; and GEORGES FLUSIN, of Grenoble, visited the scientific institutions of Washington in April. They are in the United States to make a study of the fertilizer situation.

Mr. WILLIAM VALLEY HAGAR, junior hydrographic and geodetic engineer in the Coast and Geodetic Survey, died at Tarrytown, New York, March 24, 1921. Mr. Hagar was born March 25, 1888, at Weybridge, Vermont. In 1912 he was appointed an assistant engineer in the United States and Canadian Boundary Service and was transferred to the Survey in 1913.

The will of the late Miss CAROLINE HENRY, daughter of Professor JOSEPH HENRY, first Secretary of the Smithsonian Institution, gives $1,000 to the Institution and names it as residuary legatee of an estate with provision for several beneficiaries during their lifetime.

Dr. A. S. HITCHCOCK of the Smithsonian Institution left Washington in April for a trip to the Philippine Islands, Japan, China, Indo-China, Singapore, and Java, for the purpose of studying the bamboos. He expects to be absent about eight months.

Mr. DOUGLAS KARR, junior hydrographic and geodetic engineer in the Coast and Geodetic Survey, died at his home in Passaic, New Jersey, March 20, 1921. Mr. Karr was born in New York City March 1, 1891, and was appointed an aid in the Survey in 1913. He was retired on account of physical disability only a short time before his death.

Mr. A. H. MILLER, of the Dominion Astronomical Observatory of Canada, is at the U. S. Coast and Geodetic Survey engaged in a determination of the Washington periods of a set of pendulums for the purpose of determining the difference in the constant of gravity between Ottawa and Washington. This determination is to supplement and strengthen a determination of the difference in gravity between the two stations made just before the War.

Mr. WILLIAM PALMER, taxidermist in the National Museum, died on April 8, 1921. He had been connected with the Museum since its earliest days. The numerous specimens, both casts and mounted animals, in the exhibition series testify to his skill. The exhibit of the vertebrates of the District of Columbia in the National Museum is almost entirely his work.

Dr. H. S. WASHINGTON of the Geophysical Laboratory, Carnegie Institution of Washington, has been elected a foreign honorary member of Videnskabs Selskabet i Kristiania (the Norwegian Academy of Sciences) in the section of geology, mineralogy, and physical geography. The other American members are W. M. DAVIS and J. F. KEMP.